Central Puget Sound
Regional Fare Coordination System

Stand-Alone Fare Transaction Processor Operations Manual

Document No: SEA-01097   **Category:** CDRL 34   **Revision:** 5.0

Publisher: ERG Transit Systems   **Revision Date: Dec 30, 2009**

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Contents

1   Introduction

The Stand-Alone Fare Transaction Processor (SAFTP) is a device installed on train platforms to process contactless smart card fare transactions. It is non-interactive, which means that although the SAFTP displays and processes information, it is not designed to receive instructions from a passenger or an operator.

1.1   Purpose

This document is intended for use by station platform personnel. It explains the operation of the SAFTP.

1.2   Scope

This document explains to the operator:

- The SAFTP display screens

- The factors that prompt the screens

- Their meanings of the screens

- Transactions

Maintenance of the SAFTP is covered in SEA-01120 "SAFTP Field Repair and Maintenance Manual."

2   Overview

The SAFTP device is part of the Central Puget Sound Regional Fare Coordination System (RFCS) that uses smart card technology in fare cards. Fare cards are of similar size to a credit card. The cards are batteryless, encrypted, portable, configurable memory devices which have the ability to:

- Store passenger information

- Store value

- Record past fare card transactions

Passengers can use their fare cards to travel with various operators on all modes of public transportation including train, bus, and ferry services. The SAFTP device is installed on train platforms. The SAFTP interchanges information with passenger fare cards. Passengers tag their fare cards on entering and exiting the transport system (i.e., when they begin and end their journey on the RFCS). This is explained in Appendix C How Trip Fare Credits Work 33.

All passenger transactions are passed from the SAFTP to a central computer known as the Data Acquisition Computer (DAC). The passenger transaction data, referred to as Usage Data (UD), is regularly recorded to the DAC. The DAC also sends information, referred to as Configuration Data (CD), such as an Agency-generated list of stolen or lost fare cards.

Figure 1 shows an overall view of the RFCS from the top down, illustrating the data flow involving the SAFTP.

EMBED Visio.Drawing.11

e.

Data

Clearinghouse

d.

Back Office Computer

c.

Data Acquisition   Computer

b.

SAFTP

a.
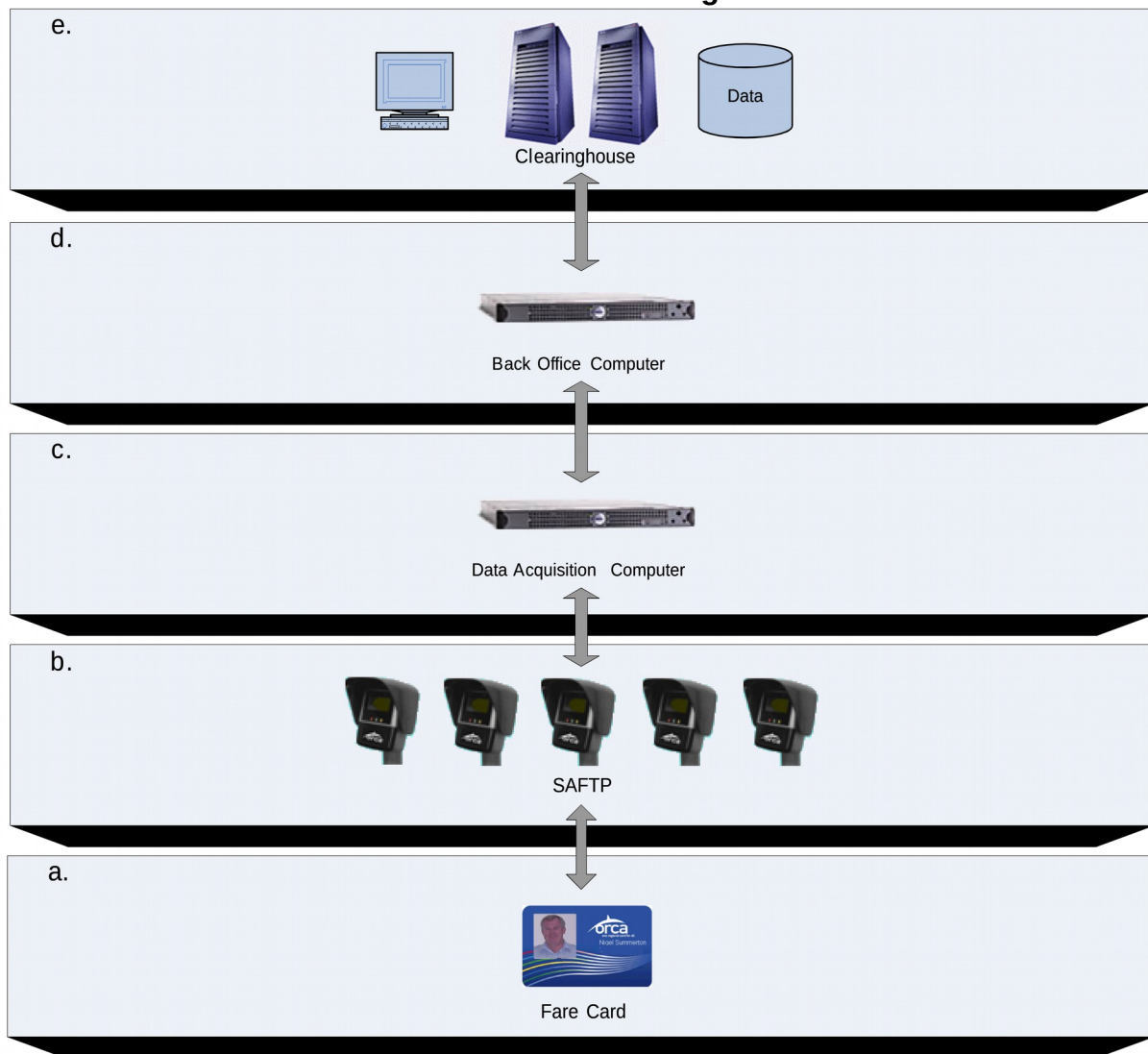
Fare Card

Figure 1: Overview of RFCS Data Flow with SAFTP

As shown in Figure 1 from bottom (fare cards) to top (Clearinghouse):

a. The passenger will tag his or her fare card at the SAFTP device.

b. Appropriate fare will be deducted and the information will be retained by both the passenger fare card and the SAFTP device.

c. The fare card information retained by the SAFTP devices is sent to the DAC.

d. Information is then exchanged with the Back Office Computer (BOC) (for example, at Sound Transit Headquarters).

e. The BOC then exchanges data with the RFCS Clearinghouse.

Figure 2 shows the **Welcome** screen on the SAFTP. The **Welcome** screen prompts the passenger to tag a fare card to the Card Target Area as represented by the One Regional Card for All (ORCA) logo.

Figure 2: SAFTP Display and Target Areas

The Card Target Area is where the card reader-writer device is installed inside the SAFTP. The Card Target Area is where the fare card will be within range. This area is approximately in front of the ORCA logo.

When the passenger tags the card at the SAFTP, three things happen:

• The screen displays an entry or exit message

• The central green LED illuminates

• A single beep sounds

On startup, the screen displays device hardware and software configuration information. This information includes equipment serial number and application version number.

3   Screen Displays

This section relates to the screen displays that occur after a passenger has tagged his or her fare card at the SAFTP. In addition to the screen displays, there are audible beeps every time a card is presented.

- When a valid card transaction is completed, a single beep sounds.

- When there is a valid card transaction with a warning message, two beeps sound.

- When an invalid card transaction is attempted, five beeps sound.

The operation of the SAFTP is automatic. However, station personnel must be prepared to explain the screen displays and beeps to the passengers as well as monitor the SAFTP for maintenance messages.

3.1   In Service Welcome

Figure 3: Welcome Screen

A **Welcome** message displays, prompting passengers to present their cards.

Note: The deducted fare value is not displayed on entry but when the passenger tags the card on exit.

After the passenger tags his or card at the Card Target Area, one of the following results is displayed:

- Valid Entry

- Valid with Transfer

- Valid Entry with Revalue

- Card Expiration Warning

- Cancelled Entry

- Invalid Card

- Blocked Card

If there is no activity after a predetermined period of time, the **Welcome** message displays again.

3.2   Valid Entry

Figure 4: Valid Entry

If there is sufficient cash in the fare card's e-purse and/or there is a valid pass on the card (i.e., the card has not already been presented), the following is displayed:

- The **Permit to Travel** screen

- The Station Location

- The ~~maximum number of available zones available on the fare card~~fare paid

In addition, the green LED lights up and a single beep sounds.

3.3 Entry Screen Displays

3.3.1 Valid with Transfer

The fare card retains a record of the previous 10 fare card transactions. The SAFTP will check to see if a transfer scenario is applicable at the time a passenger tags a fare card.

Figure 5: Valid Travel with Transfer

If the fare card satisfies the minimum payment requirements and there is a valid transfer saved on the fare card, the following is displayed:

- The **Permit to Travel** screen

- The Station Location

- The fare paid

- A **Valid Transfer** message

- ~~The maximum number of available zones to travel~~

In addition, the green LED lights up and a single beep sounds.

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3.3.2   Valid Entry with Revalue

A fare card automatic revalue occurs when value is added to the fare card in the form of a monthly pass or cash being added to the e-purse. The actual transfer of funds occurs elsewhere, but the RFCS uses the opportunity of the fare card being tagged at the SAFTP to add the value to the fare card.

Figure 6: Valid Travel with Card Revalue

The following is displayed:

- The **Permit to Travel** screen

- The Station Location

- The fare paid

- A **Card Revalued** message

- The maximum number of available zones

In addition, the green LED lights up and a single beep sounds.
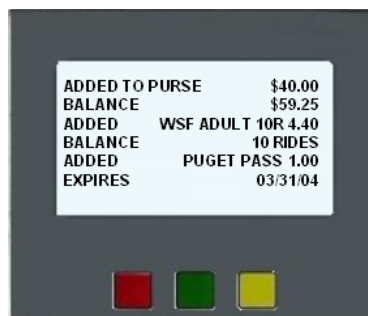
Figure 7: Card Revalue Details

The screen displays the details of a fare card revalue when the passenger holds the card at the card target area.

Values added to the card are shown on a list, and multiple pages are shown if required:

- Lines 1 and 2 show the e-purse value.

    o   Line 1 shows the value added to the e-purse.

    o   Line 2 shows the current balance.

- Lines 3 through 6 show the product.

    o   Line 3 shows a product added.

    o   Line 4 shows the current balance (in rides) or the expiration date.

> o   Line 5 shows an additional item added.
>
> o   Line 6 shows the expiration date.

Figure 8: Transfer and Card Revalued

Valid Transfer and **Card Revalued** messages can be displayed simultaneously.

3.3.3   Card Expiration Warning

Figure 9: Card Expiration Warning

If a fare card is due to expire within five calendar days, the following is displayed:

- The **Permit to Travel** screen

- The Station Location

- A card expiration warning message, with the expiration date, in Reverse text (white letters against a black background)

- ~~The maximum number of available zones~~The fare paid

In addition, the green and yellow LEDs light up and two beeps sound.

A card expiration warning may also be displayed with a **Card Revalued** and/or **Valid Transfer** messages.

3.4   Cancelled Entry
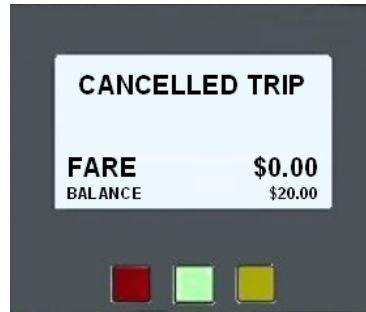
Figure 10: Cancelled Trip

If the passenger has previously tagged the card to the card target area for a valid entry but retags the card at the same SAFTP within five minutes, the following is displayed:

• The **Cancelled Trip** message

• A $0 Fare

• The fare card balance

In addition, the green LED lights up and a single beep sounds.

A full refund of the value paid on entry is transferred back to the fare card and the trip is not recorded.

Note: After five minutes, canceling an entry of a fare card will not be allowed and will be processed as a normal exit transaction with a fare charged.

4   Exit Screen Displays

After the passenger tags the card to the target area on exit, one of the following results is displayed:

- **Valid Exit** displays:

    o   An E-purse Statement showing its balance

    o   An E-purse Statement with Low Funds Warning

    o   Pass Details

    o   Pass Details with Expiration Warning

    o   Pass and E-purse

    o   Pass and E-purse with Low Funds Warning

    o   Pass and E-purse with Combined Warning

    o   With Transfer and E-purse

    o   With Transfer and Pass

    o   With Transfer, Pass, and E-purse

With all the above scenarios, if there is no activity after a predetermined period of time, the **Welcome** message displays again.

4.1   Valid Exit – With No Transfer

This section explains how the passenger is informed by the SAFTP that a fare has been paid by e-purse or pass without any transfer credit. Valid exit screens involving transfers are included in section 4.2 Valid Exit – With Transfer 21.

4.1.1   Valid Exit – E-purse Statement

TACOMA DOME – AUBURN

FARE   **$2.75**
BALANCE $17.25

Figure 11: Valid Exit Using E-purse

The following is displayed on a normal exit:

- The **Trip Start And End Locations** screen

- The fare deducted from the e-purse

- The balance of the e-purse (after the total fare has been deducted)

In addition, the green LED lights up and a single beep sounds

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4.1.2   Valid Exit − E-purse with Low Funds Warning

Figure 12: Valid Exit Using E-purse with Low Funds Warning

The following is displayed on a normal exit but where the trip has brought the e-purse level below a predetermined amount:

- The **Trip Start And End Locations** screen

- A **Low Funds Warning** message in Reverse text

- The fare deducted from the e-purse

- The balance of the e-purse (after the fare has been deducted)

In addition, the green and yellow LEDs light up and two beeps sound.

4.1.3   Valid Exit − Pass Details

Figure 13: Valid Exit Using Pass

The following is displayed a normal exit where a pass is used:

- The **Trip Start And End Locations** screen

- A description of the pass used

- The pass expiration date

In addition, the green LED lights up and a single beep sounds.

4.1.4   Valid Exit − Pass Details with Expiration Warning

Figure 14: Valid Exit Using Pass with Expiration Warning

The following is displayed on a normal exit where a pass is used but the pass is nearly at its expiration date:

- The **Trip Start And End Locations** screen

- A **Pass Expiry Warning** message in Reverse text

- A description of the pass used

- The pass expiration date in Reverse text

In addition, the green and yellow LEDs light up and two beeps sound.

4.1.5 Valid Exit – Pass Details and Deductions Made from E-purse

Figure 15: Valid Exit Using Pass and E-purse

The following is displayed on a normal exit where a pass is used but the journey also required a deduction from the e-purse (that is, when the pass paid for only part of the trip):

- The **Trip Start And End Locations** screen

- A description of the pass used

- The amount deducted from the e-purse (in the above example **PLUS $1.75** which means $1.75 was needed to supplement the pass)

- The pass expiration date

- The e-purse balance

In addition, the green LED lights up and a single beep sounds.

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                                                           Processor Operations Manual

4.1.6   Valid Exit − Pass and E-purse with Low Funds Warning

Figure 16: Valid Exit Using Pass and E-purse with Low Funds Warning

The following is displayed on a normal exit where a pass and e-purse were used but the journey brought the e-purse value below a threshold:

• The **Trip Start And End Locations** screen

• A **WARNING** message highlighted in Reverse text

• A description of the pass used

• The amount deducted from the e-purse

• The pass expiration date

• The e-purse balance highlighted in Reverse text

In addition, the green and yellow LEDs light up and two beeps sound.

4.1.7   Valid Exit − Pass and E-purse with Combined Warning

Figure 17: Valid Exit Using Pass and E-purse with Low Funds and Card Expiration Warning

The following is displayed on a normal exit where a pass and e-purse were used but the pass is about to expire and the e-purse is below the threshold:

• The **Trip Start And End Locations** screen

• A **WARNING** message highlighted in Reverse text

• A description of the pass used

• The amount deducted from the e-purse

• The pass expiration date highlighted in Reverse text

• The e-purse balance highlighted in Reverse text

In addition, the green and yellow LEDs light up and two beeps sound.

4.2   Valid Exit − With Transfer

This section explains how the passenger is informed by the SAFTP that a transfer fare credit has been given for the trip. Transfer fare credits are explained in Appendix D How Transfer Fare Credits Work 34.

4.2.1   Valid Exit − With Transfer and E-purse

Figure 18: Valid Exit Using Transfer and E-purse

The following is displayed on a normal exit where the e-purse is used and a transfer fare credit is awarded:

• The **Trip Start And End Locations** screen

• The transfer value

• The amount deducted from the e-purse

• The e-purse balance

In addition, the green LED lights up and a single beep sounds.

4.2.2   Valid Exit − With Transfer and Pass

Figure 19: Valid Exit Using Transfer and Pass

The following is displayed where a pass is used and a transfer fare credit is awarded:

• The **Trip Start And End Locations** screen

• The transfer value

• The pass product and its fare contribution

• The pass expiration date

In addition, the green LED lights up and a single beep sounds.

4.2.3   Valid Exit – With Transfer, Pass, and E-purse

Figure 20: Valid Exit Using Transfer, Pass, and E-purse

The following is displayed where both a pass and e-purse are used and a transfer fare credit is awarded:

• The **Trip Start And End Locations** screen

• The pass product and its fare contribution

• The transfer and e-purse contribution value

• The pass expiration date

• The e-purse balance (following fare deduction)

In addition, the green LED lights up and a single beep sounds.

5   Invalid Transaction Screen Displays

Cards may be invalid for a variety of reasons described in this section, including:

- Expired Card

- Blocked Card

- Card not Permitted

- Invalid Card

- Insufficient Funds

- Incomplete Transaction

- Faulty Card

- Multiple Cards

- Non-fare Cards

An invalid card will cause the SAFTP to display an appropriate message describing the condition, and will generate a series of audible beeps to alert the passenger to the situation.

With all the above scenarios, if there is no activity after a predetermined period of time, the **Welcome** message displays again.

There are two other possible displays that may appear on the screen. These deal with the functioning of the SAFTP device:

- **Unit Faulty** display

- **Out of Service** display

5.1   Expired Card

Figure 21: Expired Card

If a card has expired, the following is displayed:

- An **Expired Card** message

- A **Please Buy Ticket** prompt

In addition, the red LED lights up and five beeps sound.

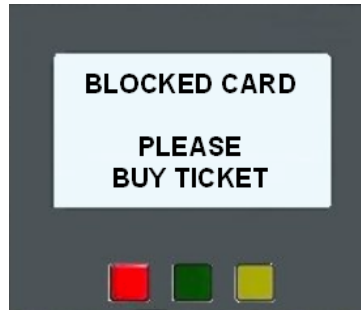The passenger should purchase a ticket.

5.2   Blocked Card

Figure 22: Blocked Card

If a card has been blocked, the following is displayed:

• A **Blocked Card** message

• A **Please Buy Ticket** prompt

In addition, the red LED lights up and five beeps sound.

The passenger should purchase a ticket.

5.3   Card Not Permitted

Figure 23: Card Not Permitted

If a card is not permitted, the following is displayed:

• A **Travel Not Permitted** message

In addition, the red LED lights up and five beeps sound.

The passenger should purchase a ticket in order to continue the journey.

5.4   Invalid Card

Figure 24: Invalid Card

If a card is invalid, the following is displayed:

- A **Unknown Card Type** message

- A **Please Buy Ticket** prompt

In addition, the red LED lights up and five beeps sound.

The passenger should purchase a ticket in order to continue the journey.

5.5   Insufficient Funds

Figure 25: Insufficient Funds

If a card has insufficient funds in the e-purse, the following is displayed:

- An **Insufficient Funds** message

- A **Please Revalue Card** prompt

In addition, the red LED lights up and five beeps sound.

The passenger should either revalue the card on another device or purchase a ticket.

5.6   Incomplete Transaction

Figure 26: Incomplete Transaction

The most common cause of an incomplete transaction is that the fare card was removed from the target area before the transaction is complete. In this instance, the following is displayed:

- A **Please Tag Your Card Again** prompt

In addition, the red LED lights up and five beeps sound.

The passenger must present the card again to the target area.

5.7   Faulty Card

Figure 27: Faulty Card

If the card is faulty, the following is displayed:

- A **Travel Denied** message

- A **Please Buy Ticket** prompt

In addition, the red LED lights up and five beeps sound.

The passenger should purchase a ticket.

5.8   Multiple Cards

Figure 28: Multiple Cards

If the target senses more than one card in the field, the following is displayed:

- A **One Card at a Time Please** prompt

In addition, the red LED lights up and five beeps sound.

Passenger should present a single card to the target.

5.9   Non-Fare Cards

5.9.1   Operator Cards

If an operator card is presented instead of a fare card, the following is displayed:

Figure 29: Non-Fare Card

In this instance the following is displayed:

- A **Travel Not Permitted** message

In addition, the red LED lights up and five beeps sound.

The passenger should purchase a ticket.

5.9.2   Operator Cards – Maintenance Role

If an operator card is presented that has a Maintenance Role in the operator application, the device will go into Maintenance Mode and the following screen will be displayed:

Figure 30: Maintenance Tests

The test sequence is carried out automatically, and makes an assessment of:

• Device configuration

• Communications link to DAC

• The Red, Green, and Yellow LED lights

• Speaker operation for audio beeps

• Card reader operation

• Screen backlight

• Screen contrast

If all tests are passed, the **All Tests Passed** screen will be displayed. If any of the tests fails, the **All Tests Failed** screen will be displayed.

Figure 31: Maintenance Tests Results

5.10   Unit Faulty

If the SAFTP is faulty, the following screen is displayed:

Figure 32: Unit Faulty

- A **Unit Faulty** message

In addition, the red LED lights up and 1 beep sounds.

Follow Sound Transit procedures to report the fault.

The SAFTP will remain in Fault mode until the fault is rectified.

5.11   Out of Service
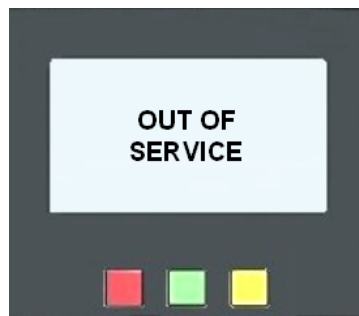
Figure 33: Out of Service

If the SAFTP enters Out of Service mode, the following is displayed:

- An **Out of Service** message

In addition, the red, green, and yellow LEDs light up.

Note: The reason for this may be either as a scheduled event defined in configuration data (CD) downloaded from the DAC or in response to a command issued from the DAC or diagnostic terminal.

If SAFTP remains out of service, follow the Sound Transit procedures to report that the unit is out of service.

Note: SAFTPs can usually continue in normal service even if they are unable to communicate with the DAC.

Appendix A Terminology

A.1   Acronyms and Abbreviations

Table 1 contains the acronyms and abbreviations that are specific to ERG. Industry standard acronyms and abbreviations are not defined in this table.

Table 1: Acronyms and Abbreviations

Acronym or Abbreviation	Definition
BOC	Back Office Computer
CD	Configuration Data
DAC	Data Acquisition Computer
ORCA	One Regional Card for All
RFCS	Regional Fare Coordination System
SAFTP	Stand-Alone Fare Transaction Processor
UD	Usage Data

A.2   Terms

Table 2 contains the terms that are specific to ERG. Industry standard terms are not defined in this table.

Table 2: Terms

Term	Definition
automatic revalue	A feature that automatically adds value to a product on a card at a predetermined threshold or time interval.
business rules	Criteria set by the Agencies regarding the use of the card and appropriate fares set (e.g., when holiday discounts apply).
e-purse	An electronic representation of the monetary value on a fare card.
fare card	A nondisposable smart card for transit use.
operator	The Agency staff member, ERG Service Bureau staff member, or any authorized person using the RFCS equipment.
operator card	A nondisposable smart card, with the operator application installed, for transit employee device access for operations, management, and maintenance.
pass	A card product that permits unlimited journeys by the cardholder on a specific transit operator within a specific time period.
target	The reader-writer installed inside the device that communicates with the card using low power radio signals.
transfer fare credit	A complete trip (e.g. Bus - Ferry - Bus) will usually cost less than the three individual journeys total amount added together. Transfer fare credits are given at the start of the second and third part of the trip taken by the passenger to enable the savings. However, the total grouping of transfers (e.g. Bus to Ferry) must be done within a defined time (usually two hours).

Appendix B Lists of Tables and Figures
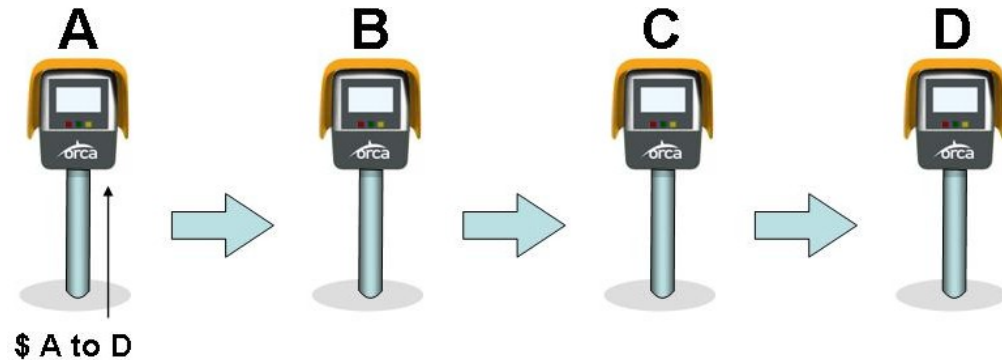
B.1   List of Tables

B.2   List of Figures

Appendix C How Trip Fare Credits Work

The following figure shows how a passenger starting a journey at station A will be charged the full fare to the last station on the line (station D).

The full fare to the furthest station on the trip is deducted from the card.

Figure 34: Trip Fare Credit

When the passengers ride the train to their destination, a conductor carrying a handheld card reader can check passenger cards for valid rides.

If the passenger leaves the train and tags off before reaching the furthest destination, an appropriate value is refunded to the card.
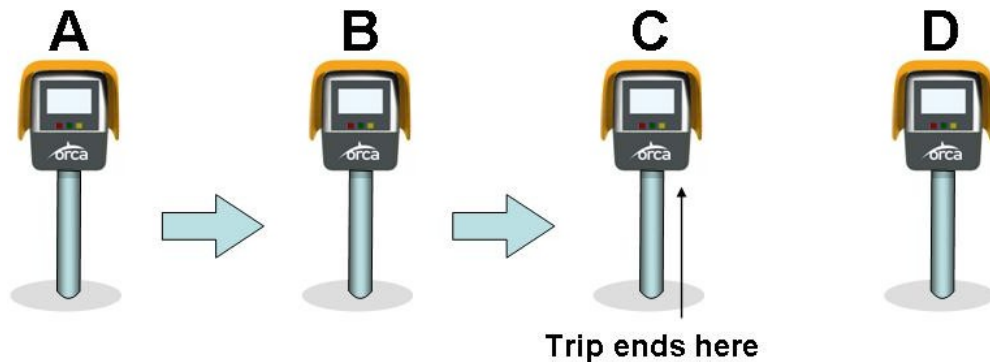
Leaving the train at station C results in a credit, so the final fare is actually $ A to C.

Figure 35: Trip Fare Credit

Appendix D How Transfer Fare Credits Work

A passenger can pay a special fare for a complete journey. Such a journey might start on a bus, continue by train, and then finish with a bus trip.

=$5.00

Figure 36: Special Fare Price

However, added together, the individual bus trip, the train fare, and the final bus fare might exceed this special fare.
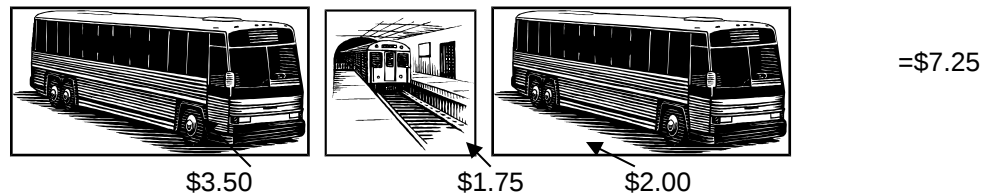

=$7.25

$3.50 $1.75 $2.00

Figure 37: Individual Fare Price

Transfer fare credits are used to recognize the amount already paid for all the legs of the journey.

The total (or a portion) of these fare credits can be used to contribute toward the fare for subsequent legs of the passenger journey.

In this bus-train-bus scenario, the passenger's card will first be debited the individual bus trip fare.

$3.50

Figure 38: Start of Multiple Modes

The passenger will tag the card at an SAFTP at both the beginning and end of the train portion of the journey. However, when the passenger tags the SAFTP after exiting the train, the RFCS will recognize his or her previous bus trip and the rail journey just undertaken and award a transfer fare credit.

~~$1.75~~ $0.75

Figure 39: Earning Transfer Credit – Midtrip

This works because the card retains three significant pieces of information about the previous leg of the journey:

• The Agency that provided the service

• The date/time of the last fare deduction from the e-purse

• The total transfer fare credit amount that can be applied to the next leg of the journey

There is a time limit. In general, the last deduction from the e-purse must have occurred within the last two hours for the transfer fare credits to still be applicable.

Figure 40: Fare Credit Time

The specific time for the transfer window is configured through CD.

In this example, a $1.00 transfer fare credit has been applied to this leg of the journey when the passenger tags his or her card at the SAFTP when the rail trip ends. The passenger will expect this, because the SAFTP also advised that a transfer was applicable when the passenger tagged on (see section 3.3.1 Valid with Transfer on page 12).

Therefore, only $0.75 is deducted from the e-purse for this $1.75 fare.

TACOMA DOME – AUBURN

TRANSFER $1.00
FARE   **$1.75**
BALANCE $18.25

Figure 41: Exit with Transfer

A similar credit can be given on the final leg of this journey when the passenger tags on the bus.

Note: Transfers are not currently supported on ferry trips. However, if a ferry trip is part of the journey, it will not affect the accumulated transfer credits from the other forms of transport.

Note: When transfer credits are used between different Agencies, there might be a surcharge levied on a per-passenger basis.

Appendix E References

[1]   Contract 229944 (April 29, 2003)
Division III: Equipment Specifications.

[2]   SEA-01120
SAFTP Field Repair and Maintenance Manual

[3]   SEA-01056
Stand-Alone Fare Transaction Processor (DR 106B) - Functional Specification

[4]   SEA-01055
Stand-Alone Fare Transaction Processor (DR 106A) - Hardware Specification

Appendix F Document History

Revision	Revision Date	Reason for Issue	Author
0.1	14 Jun 04	Draft	Doug Connell
0.2	23 Sep 05	First submission	Chris Meynell
0.3	2 Dec 05	Style revisions	Chris Meynell
0.4	30 Jan 06	Revisions from Peer and Tech reviews	Steve Jackson
0.5	16 Feb 06	Final Edit	Magen Gulliford
1.0	22 Feb 06	Release to Customer	Patrick Branch
1.1	20 Apr 06	Embodiment of customer comments and some additions	Chris Meynell
1.2	20 Apr 06	Edit/format for resubmission	Stephen Lynch
2.0	24 Apr 06	Release to Customer	Patrick Branch
2.1	29 May 06	Sections 4.4.1 (Training Mode) and 4.5 updated from developer comments. Section 4.4.2 added for Maintenance operations.	Steve Jackson
2.2	13 June 06	Edit/format for resubmission	Magen Gulliford
3.0	14 June 06	Release to Customer	Patrick Branch
3.1	12 Oct 08	Update for Release 4	Joan Bayer
3.2	23 Oct 08	Edit/format for resubmission	Stephen Lynch
4.0	27 Oct 08	Release to Customer - Release 4 Trng - ERG Submits [SEA300850]	Rose Fallaw
4.1	27 Oct 09	Update screenshots for As Built (CR-002361)	Joan Bayer
4.2	4 Dec 09	Edit for Submittal	Michael Grey
5.0	30 Dec 09	Release to Customer	Rose Fallaw